STAFF REPORT

RESOLUTION REGARDING
THE REUSE OF FOOD PROCESSING BY-PRODUCTS WITHIN STANISLAUS COUNTY

Introduction

Stanislaus County established a voluntary Food Processing By-Products Use Program (hereafter Program) in 1978 to encourage the diversion of solid and semi-solid food processing waste from county landfills. Under the Program, the County permits food processors (both within and outside the County) to transport food processing waste for use at cropland, feedlots, composting, and dehydrating operations. The types of solid and semi-solid food processing waste historically included in the Program include rejected fruit and vegetable products, solids screened from food processing wastewater, food processing wastewater, and nutrient- and organic-rich sediment generated from the recycling of water in food processing flume conveyance systems. Under current state regulations, this material is too wet to be discharged to a landfill, and therefore must be disposed of elsewhere.

The discharge to land of solid food processing waste for use as a soil amendment has historically been regulated by the Regional Board under Resolution No. 82-036, which was a waiver of waste discharge requirements (WDRs) for a number of types of discharges. The waiver included the categories "agricultural commodity wastes" and "food processing wastes spread on land" as discharges that were waived contingent upon an approved operating plan and small, seasonal operations. Senate Bill 390 caused all waivers in existence at that time to expire on 1 January 2003. Staff has been working since then to determine an appropriate mechanism to regulate the entities enrolled in the County's Program. The discharges could be regulated under either individual or general WDRs, or possibly under a waiver of WDRs.

Stanislaus County has requested that the Regional Board delegate responsibility for direct regulatory oversight of the individual operations to the County, and to formally waive the need to adopt WDRs for the individual operators within the County. The basis for this request is that Stanislaus County has developed and implemented a program to regulate the discharge of solid food processing waste within its county. However, staff has determined that it is not appropriate to proceed with a waiver at this time, as questions exist as to the impacts on water quality.

Potential Water Quality Impacts

The discharge of solid food processing waste to land is an inexact science highly dependent upon the constituent, soils, climate, other practices that affect the property, and on sound waste management and control. The process depends upon attenuation (decomposition, immobilization, and transformation) in the soil profile and consumption from the root zone by crops to remove waste constituents.

Excessive land application of high-strength food processing waste residues and liquids can overload the shallow soil profile, create anaerobic soil conditions, retard the degradation, stabilization, transformation, and immobilization of waste constituents, and create objectionable odors that lead to nuisance, as defined by California Water Code (CWC) Section 13050. Degradation of organic matter within the soil profile generates carbon dioxide gas, which readily dissolves in soil pore water to form bicarbonate alkalinity. Organic acids formed in the decomposition of organic waste can decrease soil pH, which can lead to the dissolution of soil minerals such as calcium and magnesium. If soil pH

decreases below 5, metals may become solubilized and can degrade underlying groundwater if the buffering capacity of the soil is exceeded. Soil bacteria transform organic nitrogen in the applied waste into inorganic nitrogen (i.e., ammonia, nitrite, and nitrate). Nitrate and nitrite are highly soluble, not bound to soil, and are readily leached through the soil profile and into groundwater. When organic loading is excessive, facultative and anaerobic soil conditions can lead to the mobilization of manganese, iron, and arsenic compounds. Hydraulic overloading (i.e., though excessive liquid waste application, low-efficiency flood irrigation practices, or significant and sustained precipitation) flushes waste constituents, the byproducts of organic degradation, and dissolved minerals deeper into the soil profile where they continue to leach into and unreasonably degrade groundwater.

Salinity is an even greater concern. Solid and liquid wastes from food processing industries tend to be highly saline. Organic waste materials naturally contain salt. Additional salt enters the waste stream through the use of cleaning and processing chemicals. The Regional Board has found through experience that almost every food processor generates saline waste, whether or not a brining process is involved. While the organic form of salts (volatile dissolved solids) can be degraded within the soil profile, the inorganic portion of salt (fixed dissolved solids) is typically not taken up by the crops, and therefore is available to migrate to groundwater. In addition, data submitted to the Regional Board shows that if food processing waste is over-applied to a field, then a substantial portion of the organic form of salinity also moves through the soil profile and into groundwater.

Stanislaus County Program

As described in the Stanislaus County *Food Processing Residue Use Program Fact Sheet*, "Stanislaus County established the food processing residue use program in the summer of 1978 through a cooperative effort of the County, the food processing industry, haulers, and the end users of the food processing residue. Food processing residues are waste materials generated from food product processing such as culls, stems, and other fruit and vegetable byproducts. These residues are used for animal feed and for soil enrichment. Food processing residues are used by dairies, animal feedlots, animal feed manufacturers, and land-spreading operations… The majority of food residue in the program originates from food processing plants within Stanislaus County. Residue products are comprised mainly of wastes from tomatoes, beans, broccoli, cauliflower, bell peppers, potatoes, yams, melon, grapes, cranberries, prunes, peaches, and fruit cocktail mix." Staff's review finds that through 2005, a significant amount of olive waste has also been applied to land and that the County has periodically authorized the discharge of other wastes not described above."

Each end user is required to obtain a permit from the County. The *Fact Sheet* states "The permit requires a detailed plan of operations, which includes a description of the drainage system, the maximum amount of residue received per day, and the method of handling the residue. The program is currently funded by the permitted food residue sites. Inspections are conducted frequently during the season at each site. The inspector looks for evidence of flies, odor problems, and improper drainage. The site monitor works closely with the site operator to correct any problems.. During the first 22 years of the program, more than 5.8 million tons of food residue was diverted away from the landfill by this program."

The County currently allows solid food processing waste to be discharged for land application, direct animal feed, dehydration, and composting. Currently, there are two land application sites enrolled under the Program (Mape's Ranch and Dos Rios Ranch, both owned by Lyons' Investments) and

approximately 20 direct animal feed sites. There is one dehydrator. No composters were enrolled in the Program in 2004 or 2005.

Review of County Program

An overall review of the County Program finds that:

- The Program criteria, combined with regular and frequent inspections of permitted sites by County staff for evidence of flies, odors, and improper drainage, have effectively prevented nuisance conditions.

- Although not documented in the monitoring reports, it is believed that the discharge of solid food processing wastes to land has not resulted in a discharge of waste to surface waters. This statement is based on the Plan of Operation for the two land application sites, which states that "existing on-site drains…will be plugged during times of operation" and "a 12 to 18 inch temporary contained dirt berm will be established on site perimeters" prior to the spreading of solid food processing waste. It is assumed that the Program criteria are sufficient.

- Program criteria may be unilaterally changed by the Stanislaus County Department of Environmental Resources.

- The Program's focus has been on prevention of nuisance conditions and the release of pollutants to surface water, and on the discharge of waste constituents which are uptaken by agricultural crops.

- The Program attempts to protect groundwater at the land application sites by stating that fields must be cropped and that wastes shall be applied at agronomic rates. However, this only protects groundwater from degradation by plant nutrients. Staff is unaware of any agronomic rates for salinity or metals.

<u>Direct Animal Feed</u>
The County Program allows solid food processing waste to be delivered to these facilities on a year-round basis. The receiving pad must be constructed of cement or asphalt to prevent the migration of leachate, and must have drainage facilities such that no liquid may be discharged. To prevent nuisance conditions, only that amount of material which can be fed to the animals or processed within 24 hours may be delivered at one time. The permitee must maintain records of the amount of solid food processing waste delivered to the site, analyze samples of the waste, and submit an annual report.

Staff's review of this portion of the Program finds that it should be adequate to prevent nuisance conditions and water quality impacts. This statement is predicated on the County making regular inspections and timely enforcing any noted violations.

<u>Composting and Dehydration</u>
Staff's review of the composting and dehydration operations finds that the Program is not adequate to prevent nuisance conditions and adverse water quality impacts with respect to leachate and stormwater discharges, and because such facilities have multiple water quality issues, they are more appropriately regulated under either individual or general WDRs. At a meeting on 9 February 2006, Stanislaus County agreed that it is appropriate for the Regional Board to regulate all waste storage and disposal

activities at composters and the dehydrator in a manner other than through the Program. Staff have subsequently requested a Report of Waste Discharge from the dehydrator and have sent a draft General Order for Green Waste Composters out for public comment.

Land Application

As required by the Program, Lyons' Investments submits Annual Monitoring Reports and an annual Plan of Operations to Stanislaus County. Staff have reviewed the 2002 through 2005 annual reports, as well as the March 2005 Plan of Operations for the Dos Rios and Mape's Ranches.

Between 2002 and 2004, the discharge of solid food processing waste to land increased. This appears to mainly be because in 2004, Dos Rios Ranch began accepting the waste on a year-round basis. It is unknown why there was a decrease in volume in 2005.

Year	Volume of material (cubic yards)	Acreage at Dos Rios	Acreage at Mape's	Total Acreage
2002	149,643	450	150	600 acres
2003	148,940	500	150	650 acres
2004	169, 783	717	58	775 acres
2005	53, 144	384	240	664 acres

Material discharged in 2004 and 2005 included corn syrup, apricot, peaches, pears, pear puree, tomato, grape stems, pomace, olives, slurry, mud, peach pits, and "mixed loads".

The County Program requires that the "byproducts shall be tested for the following parameters and constituents: moisture, total nitrogen, organic carbon, potassium, calcium, magnesium, and phosphorus." The County does not specify the number of samples which must be collected, whether samples must be taken from each type of byproduct, or the timing of sample collection. In addition, the County does not require monitoring of several constituents of concern for water quality impacts, including total dissolved solids and pH. In 2004, Lyons Investments collected grab samples from 50 of the 5,120 truckloads and in 2005, from 53 of the 2,699 truckloads it received. Because only 1.3% of the truckloads were sampled over the two-year period, there may be some question as to whether the results described below are representative.

Selected results, and an analysis of the data, are as follows:

By-product constituent	2004 result	2005 result
Moisture content	87%	91%
Pounds nitrogen applied to land	48 lb N/acre	13 lb N/acre
Average pH	4.46	Not analyzed
Total dissolved solids	Not analyzed in 2004; 14,000 mg/l in 2002	16,600 mg/l (with 8 samples greater than 40,000 mg/l)

The moisture content of the by-products varies, with 2005 samples ranging from a low of 65% moisture to a high of over 96% moisture. This data, as well as staff's June 2004 inspection, shows that the material discharged ranges from a fairly solid state to a liquid state. Staff is concerned that the liquid wastewater discharges may migrate to groundwater prior to crops being planted and uptaking the waste constituents.

According to the annual summary reports, the nitrogen loading rate in 2003 was about 48 pounds/acre, and decreased in 2005 to 13 lb/ac. These values were calculated assuming the food processing residue contained a uniform nitrogen composition and was applied evenly over the land. However, the reports do not contain enough detail to substantiate these assumptions. Therefore, while the assumed average nitrogen loading rate is sufficient to protect water quality, it is unknown whether this is actually the case. For example, during an inspection of Mape's Ranch on 24 June 2004, staff observed peach slurry being discharged from the back of a tank truck. The liquid rapidly infiltrated through the sandy soil. Consequently, soluble waste constituents (i.e., nitrogen) may not stay in the upper profile for eventual crop consumption. Waste constituents in the liquid which are not attenuated by the soil may leach to, and unreasonably degrade, groundwater.

The by-products were sampled for total dissolved solids (TDS) concentrations only in 2002 and 2005. The average TDS in 2002 was 14,000 mg/l, while the average concentration in 2005 was 16,600 mg/l. A review of the 2005 data shows that eight of the 53 samples had a TDS value of over 40,000 mg/l. In addition, the single sample of olive by-product was not analyzed for TDS; however, based on the elevated sodium and calcium concentrations in this sample, it is assumed that the TDS would be also be elevated. Staff is concerned about the water quality impacts of applying high-strength waste to land. As a point of reference, the most protective agricultural water quality criterion for groundwater is 450 mg/l TDS. It is unknown how much of this salt is present in an organic form (which may be degraded by the soil) or how much is present in an inorganic form (which typically migrates into groundwater). It is also unknown whether the cropping practices have been sufficient to prevent groundwater impacts.

Although not listed in the above summary table, the Annual Summary Reports contain analytical data for certain metals (such as aluminum, copper, zinc, nickel, and lead). The acidic pH of the by-products (4.46 pH in 2004) leads to concern that the by-products could leaching metals from metallic conveyance pipelines and storage vessels, and once discharged to the land application area, could possibly degrade groundwater.

Review of the data in the summary reports indicates that, besides containing appreciable concentrations of decomposable nitrogen and phosphorus compounds, accepted residues contain iron and other waste constituents (e.g., aluminum and manganese) in concentrations that exceed applicable water quality limitations by several orders of magnitude. If discharged at excessive rates, the residues could adversely affect groundwater quality. For example, in 2005, total nitrogen and sodium concentrations of applied residues were as high as 6,500 mg/kg and 1,700 mg/kg, respectively. Also, the data in the table indicates that samples of residues were acidic, with pH values averaging 4.6 pH units. The discharge of acidic waste to soil with little or no soil buffer capacity can lead to acidic soil conditions, which can be detrimental to certain bacteria responsible for decomposing organic matter and transforming organic nitrogen into plant-available nitrogen, as well as to bacteria responsible for denitrifying nitrate. The low pH conditions can also mobilize metals in the soil. It is noted that groundwater monitoring has never been conducted at the land application sites, so it is unknown at this

time whether any groundwater degradation has occurred during the last 20 years of applications under the County Program.

Water Quality Concerns

To summarize, staff believe that the Stanislaus County Program is adequate to prevent creation of nuisance conditions and to prevent impacts to surface water. While staff have little concern regarding the rate of nitrogen loading to the soil, it is unknown whether the Program is adequate to control or monitor other threats to groundwater quality, because:

(a) the County requires minimal monitoring of the by-products and of the soil and does not require groundwater monitoring;

(b) first encountered groundwater at the application area is expected to be between 10 and 15 feet below the ground surface;

(c) the average total dissolved solids (TDS) concentration of the by-products in 2005 was 16,000 mg/l (with some material containing TDS concentrations in excess of 40,000 mg/l);

(d) it is unknown what percentage of the TDS is present in the organic form and will therefore degrade within the soil profile;

(e) the average pH of the by-products in 2004 was 4.46 pH units which could cause metals in the native soil or in by-products to be mobilized and adversely affect groundwater;

(f) the average moisture content of the by-products in 2005 was 90%, which may allow the material to migrate to groundwater prior to the planting of crops;

(g) it is unknown whether the on-site storage of food processing by-products during rainy periods is conducted in a manner that is protective of groundwater quality;

(h) the Program's limit as to the types of materials accepted may not be sufficient to protect water quality; and

(i) the Program does not appear to prohibit the discharge of liquid wastes which more appropriately should be discharged to a public wastewater treatment facility or under individual land-discharge waste discharge requirements.

Proposed Resolution

Staff has determined that it is not appropriate to proceed with a waiver at this time, as questions exist as to the potential water quality impacts associated with the discharge of food processing by-products to land. Instead, staff have prepared a resolution that allows Stanislaus County to continue oversight of its program while it sponsors a study to (a) determine the effect of the land application of food processing by-products on water quality and (b) determine additional requirements or enhancements to the current Program that are necessary to ensure the protection of water quality and the environment. The study results will be used by the Regional Board to establish future WDRs or a waiver with appropriate conditions for the application of food processing by-products to land for those sites enrolled in the County Program.

The proposed Resolution requires that the County continue to implement, inspect, monitor, and enforce its Program while it oversees a literature review, and possibly a study, designed to address the concerns listed above. The County's study team and researchers are to regularly consult with staff from the Regional Board, Department of Food and Agriculture, and California Integrated Waste Management Board. The Resolution states that a workplan must be submitted by 1 August 2006, with the final report to be submitted by 1 July 2007. It is staff's intent that data from the final report will be used to prepare a regulatory program (WDRs or waiver) which will be in place prior to the 2008 food processing season.

It is noted that adoption of this resolution does not limit the Regional Board's authority under any applicable laws. This includes the authority to take enforcement action, where appropriate, to address nuisance conditions or surface water impacts, as well as the authority to issue waivers or waste discharge requirements to individual land application sites if the Board determines such actions are necessary due to failure by the County to meet the conditions of this resolution.

Response to Comments

The tentative Resolution was released for public comment, and we received comments from Stanislaus County, Delta Keeper and California Sportfishing Protection Alliance, the Manufacturers Council of the Central Valley, the California League of Food Processors, Del Monte Foods, Stanislaus Foods, Stanislaus County Food Processing By-Products Use Committee, and Bill Lyons Jr. (representing Mape's Ranch and Lyons' Investments). The comment letters from Stanislaus County and DeltaKeeper/CSPA are found as attachments to this staff report. The remaining letters supported the County's comments.

Stanislaus County asked for a number of small changes to the resolution, which were made. The County also stated in a meeting that the description of the water quality concerns (Finding 9.a) and the study requirements (Item No. 2) were unclear and provided suggested revisions. In response, staff edited these two sections to more clearly state the concerns and what is required of the County.

DeltaKeeper/CSPA are supportive of the study concept but have a number of concerns about the resolution. First, there is a perception this resolution promotes a future waiver of WDRs. However, it is not staff's intent to pre-determine the appropriate regulatory vehicle for this discharge of waste. As stated in Finding No. 11 of the proposed Resolution, "this resolution sets forth tasks that should provide information to support adoption of a Regional Board regulatory program that could include waste discharge requirements (WDRs) or a waiver of WDRs." It is expected that Stanislaus County will oversee a study that will address the concerns identified in the Resolution and the study will allow staff to propose the appropriate manner of future regulation. Second, the absence of a full monitoring and reporting program is noted. Stanislaus County does require monitoring. The appropriate monitoring and reporting program will be determined at the conclusion of the study. In addition, there are concerns that Reports of Waste Discharge should be submitted for all dischargers and that degradation is not in the public interest. The study concept is to determine the effect on water quality and additional requirements necessary to ensure water quality protection. Once the study is concluded it will be possible to address degradation, the public interest and the appropriate regulatory program.